

Reflections on the Successful NRIFD/NIST Collaboration
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Introduction

This symposium has been organized to honor the 50th Anniversary of the National Research Institute for Fire and Defense, NRIFD. An anniversary is a time for reflection, assessment, rededication to things we hold dear and important, and for looking ahead. In the few moments I have today, I would like to spend a minute or so on each of these topics. The bottom line of my remarks is simply that the collaboration between NRIFD and NIST has been a good one and for important reasons. As I think about the common issues and challenges we face today and those looming up before us in the foreseeable future, I can only conclude that our relationship should become even more important and productive in the future than it has been in the past. For us, that is a delightful idea. NRIFD has a distinguished record of accomplishment and great potential for the future.

Reflection

My knowledge base on the relationship between NRIFD, then known as the Fire Research Institute (FRI), and NIST is linked to the UJNR Panel on Fire Research and Safety and that began in April of 1976 in Washington, DC. That occasion led to a very productive series of meetings and a number of highly beneficial staff exchanges and technical collaborations. Table 1 presents a listing of the meetings of the UJNR Panel on Fire Research and Safety, which shows the dates, locations and Directors of the three principal organizations. I think it remarkable this collaboration has lasted as long as it has, especially in view of the fact that there have been so many different leaders involved over the years. I suspect this longevity has every bit as much to do with the fruits of the individual technical collaborations as it does with who the Institutes' Directors have been.

What does it take to make a meaningful collaboration? It has been my experience, there are at least three necessary conditions which have to be met for a meaningful collaboration to take place; trust, mutual respect, and mutual benefit. Perhaps, these conditions are self evident to most of you. The UJNR meetings provided a wonderful opportunity for our respective staffs to get to know each other and to share their research results and ongoing research interests. Consequently, bonds of friendship were formed and mutual interests established which met the first two conditions--trust and mutual respect. The third condition, mutual benefit, was and continues to be met by the Institutes' managers when we provide financial support for the exchanges and joint projects our researchers have developed.

Today, we are singling out the collaborations between NRIFD and NIST and, as we shall see in a minute, the list of collaborations is very gratifying. (As we observed at the BRI

anniversary in 1996, the same can be said for the many fruitful relationships between BRI and NIST researchers.)

This is my fourth visit to NRIFD over a period of about 16 years. The last visit was in 1996. It has been exciting to see the evolution of your campus. We are envious of the wonderful facilities you have developed over this time, of your working relationship with the fire services in Japan, and duly impressed with the terrific job you are doing in dealing with the post-earthquake fire hazard. The studies you conducted of the 1995 Great Hanshin-Awaji Earthquake provide a wealth of valuable information for researchers around the world.

Recently, NRIFD has been an active participant of the Forum for International Cooperation on Fire Research. The "FORUM", as we call it, is an informal association of heads of fire research organizations who meet periodically to share perspectives on research priorities, issues of mutual interest and to work collectively to advance fire safety engineering. The FORUM helps us both stay in touch with all the major fire research organizations in the world.

Assessment

What have we accomplished through the NRIFD/NIST collaboration? A partial list is shown on Table 2. I say "partial" simply because I doubt I have captured all that actually took place. What is shown here are those for which I was able to find records. It is most likely that there are many additional exchanges that have taken place between individual pairs of researchers at NRIFD and within USA and that is as it should be. Thus, most likely this Table represents but the tip of the iceberg in terms of actual interactions between staff of NRIFD and NIST.

Considering the differences in language and culture which tend to separate us, and the many additional competing pressures for our time which arise in the context of the agencies we each serve, this is an impressive level of interchange.

A closer look at just some of the collaborations noted on Table 2 suggests we have accomplished quite a bit. Some of the most important informal collaborations I can recall are not even shown on this chart. Those involved Jin, Bryan, Levin and Nelson and dealt with various aspects of the behavior of building occupants during a fire. In particular, Jin's seminal experiments on the behavior of occupants in the presence of smoke, enabled meaningful evacuation models and a major component of our HAZARD and FPEtool software.

In 1980, Mulholland, the first NIST researcher to work at NRIFD, in collaboration with Koseki conducted experimental studies of oil burning on water to examine the effects of scale on smoke emissions and thermal radiation. In the process, they reported the phenomena of boil over of the water under the oil.

Steckler's landmark studies on the quantification of the flow rate of gases from a fire compartment and his collaboration with Satoh, opened the way for important gains in compartment fire modeling.

The 1986 collaboration between Satoh and Evans addressing comparative studies of zone and field model predictions of ceiling jet gas temperatures, marked the beginning of our mutual interest in CFD modeling.

As evident from Table 2, the mutual interest in large fires, especially oil fires, has been an enduring one covering a span of 10 years and it is still going. This series of studies has explored all aspects of large fires, their smoke composition and movement, radiation, and ultimately, I suspect, will extend to large fire suppression as well. This includes the many exchanges involving Koseki, Yamada, Mulholland, Evans, Madrzykowski, et al. Luckily for us, the ambitious campaign to expand the facilities at NRIFD coincided with the failure of NIST's smoke abatement systems leading us to take advantage of your generous invitations to conduct a series of full scale fire tests in the new facilities in Mitaka. Consequently, burning as an oil spill clean-up strategy is now accepted in the USA as an alternative to much less efficient and more costly mechanical methods.

Yamada and Cooper collaborated on experimental and analytical studies of flows through ceiling vents in atria fires which added substantively to the LAVENT code.

Sekizawa's initial visit to NIST in 1987, launched an enduring collaboration (with John Hall) dealing with analysis of fire statistics and fire risk analysis.

Another important aspect of our collaboration has been exchanges related to disasters. For example, during the period we have been working together, both the USA and Japan have experienced major earthquakes--in Japan, the Hokkaido and Great Hanshin-Awaji, and in the USA, the Loma Prieta and Northridge earthquakes. Exchanges relating to these events have been beneficial to both sides.

Rededication

Both NRIFD and NIST fire research have strong relationships with the fire services in our respective countries. Both laboratories are chartered to advance technologies of fire fighting and fire protection and, also, to enhance the safety and effectiveness of fire fighting. But, fire research is expensive. Neither of us has the resources it would take to do all that needs to be done by ourselves. We are interdependent. Also, since fire is a rare random event, we must be able to share and benefit from each others experiences: for example, joint site visits, post investigation briefings, participation in major fire tests, etc. Also, we learn from each other. It is wonderful that we are in a position to benefit from each other's riches as well as learn from each other's tragedies.

Looking Ahead

There are a number of common issues confronting fire research laboratories around the world. These include equipping the fire fighter of the future to make this highly hazardous occupation safer and more efficient, providing tools and technologies for mitigation of post-disaster fires,

improving the reliability of fire safety systems in buildings and facilities, finding cost-effective replacement/next generation fire suppressants, and reducing the false alarm rate of detectors. Increasingly, scientifically-based fire test and measurement methods are replacing traditional rating and ranking schemes and the test methods associated with them, especially in conjunction with performance-based techniques. The costs of large-scale fire tests continue to increase and few nations have or can afford all the test facilities they may desire for such purposes. Concurrently, advances in computing power and CFD techniques, e.g., LES models, are making it possible to contemplate using simulations to complement and ultimately to replace much of the large-scale fire testing.

Further, we can be assured that new risks--be they associated with new materials, advanced technologies, changing human behaviors, or mounting terrorism--will arise to confront us. In all these instances, we both benefit from continued close collaboration.

Closing Comment

Fire research is at an exciting juncture at this the 50th Anniversary of NRIFD. There are many challenges and opportunities before us. The collaborations of the 1980s and 1990s have prepared us well for working together to address them to mutual benefit and to the benefit of those we serve. On behalf of the fire researcher staff at NIST, we salute you all on this distinguished 50th Anniversary of NRIFD and look forward to working together with you for many more years.

Table 1. Meetings of the UJNR Panel on Fire Research and Safety

	Dates	Location	Director General BRI, FRI Director, CFR/Deputy Director, BFRL
1	7-8 April 1976	Washington, DC, USA (planning meeting)	BRI - Kazuhisa Shirayama FRI - Yohei Kumano NBS/CFR - John Lyons
2	19-22 October 1976	Japan	BRI - Kazuhisa Shirayama FRI - Yohei Kumano NBS/CFR - John Lyons
3	13-17 March 1978	Gaithersburg, MD, USA	BRI - Kiyoshi Nakano FRI - Yohei Kumano NBS/CFR - John Lyons
4	5-9 February 1979	Tokyo, Japan	BRI - Kiyoshi Nakano FRI - Yohei Kumano NBS/CFR - Frederic Clarke
5	15/24 October 1980	Gaithersburg, MD, USA	BRI - Kiyoshi Nakano FRI - Yoshiro Yahazuno NBS/CFR - Frederic Clarke
6	10-14 May 1982	Mitaka/Tokyo/Tsukuba, Japan	BRI - Katsuro Kamimura FRI - Yoshiro Yahazuno NBS/CFR - Jack Snell
7	24-28 October 1983	Gaithersburg, MD, USA	BRI - Katsuro Kamimura FRI - Akio Watanabe NBS/CFR - Jack Snell
8	13-21 May 1985	Tsukuba, Japan (Gann)	BRI - Hiroshi Takebayashi FRI - Akio Watanabe NBS/CFR - Jack Snell
9	4-8 May 1987	Norwood, MA, USA	BRI - Akira Takahashi FRI - Shuzo Yamashika NBS/CFR - Jack Snell
10	9-10 June 1988	Tsukuba, Japan (Gann)	BRI - Susumu Fujimatsu FRI - Shuzo Yamashika NBS/CFR - Jack Snell
11	19-24 October 1989	Berkeley, CA, USA	BRI - Shigenobu Koizumi FRI - Shuzo Yamashika NIST/CFR - Jack Snell
12	27 October - 2 November 1992	Tsukuba/Mitaka, Japan	BRI - Shin Okamoto FRI - Hiroaki Sasaki NIST/BFRL - Jack Snell
13	13-20 March 1996	Gaithersburg, MD, USA	BRI - Yoshio Mimura NRIFD - Nobuo Jiromaru NIST/BFRL - Jack Snell
14	27 May-3 June 1998	Tsukuba/Mitaka, Japan	BRI - Yutaka Yamazaki NRIFD - Asamichi Kamei NIST/BFRL - Jack Snell

Table 2. Staff Exchanges Between FRI/NRIFD and CFR/BFRL

Place	Date	Name	Topic
	1980	G. Mulholland	Smoke filling experiments
FRI	1983	K. Steckler - K. Satoh - H. Koseki	Compartment fire flows
CFR	1985	H. Koseki	
FRI	1986	D. Evans - K. Satoh	Enclosure fire modeling: CFD vs. zone models
CFR	1987	A. Sekizawa	
FRI	1988-9	G. Mulholland	Smoke emissions from pool fires
CFR	1989-90	T. Yamada	Radiation heat transfer
FRI	1990	G. Mulholland - H. Koseki	Burning and smoke production of crude oil. Test of instrumentation for NIST Blimp
FRI	1991	(A. Hamins), Mike Klassen	Crude oil combustion
FRI	1992	K. Notarianni, D. Madrzykowski	Oil spill burning
FRI	1992	T. Yamada - L. Cooper	Smoke movement in atria
BFRL	1993	H. Koseki	Thermal radiation for scaling large fires
	1993	R. Bukowski - A. Sekizawa	Site visit to Hokaido-Nansai-Oki earthquake
FRI	1993	N. Saito - A. Hamins	Halon replacements for extinguishing fires
FRI	1994	D. Evans, D. Madrzykowski, J. McElroy	Large fires
	1994	H. Baum - T. Yamada	CFD modeling
NRIFD	1996	T. Yamada - L. Cooper	Ceiling jet calculations
NRIFD	1997	T. Kashiwagi	Fire safety in micro-gravity
NRIFD	1997	D. Evans - D. Madrzykowski - A. Sekizawa	Studies on post earthquake fires and effective suppression methods
BFRL	1997	N. Saito - C. Womeldorf	Halon replacement
NRIFD	1998	R. Rehm (H. Baum) - A. Sekizawa - T. Yamada	Large-scale oil fire tests in Hokaido